In normal southwest monsoon conditions, the rains peak in the last two weeks of July. Until early August there are frequent spells of rains when it can rain for two or three days continuously. Thus the risk of inundation of the nest is high until mid-August. Females commence laying at such a time that the risk of loss of eggs through inundation or bad weather is reduced. Thus females begin egg laying only in early August, with a peak a little later, and avoid the majority of the rains of the southwest monsoon. Heavy rains are brief from mid-August, and barring the early nesters, most others effectively minimise the risk of nest inundation.

Several studies have shown that inundation or bad weather comprises a significant proportion of factors that destroy eggs and nests (Shipley 1984, Warriner *et al.* 1986). Thus females have adapted to nest when the probability of bad weather is least.

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13. THE RELATION BETWEEN BUSTARD BODY SIZE AND DISPLAY TYPE

(*With two text-figures*)

The variation in body size within the family Otididae is extreme. The smallest species (lesser florican *Sypheotides indica*) weighs about 0.5 kg (wing length 180-248 mm) while the largest species Kori (*Ardeotis kori*) weighs over 10 kg (wing length 629-761 mm) and the heaviest great bustard (*Otis tarda*) can weigh over 15 kg. Bustard display types are also varied and include both ground and aerial displays.

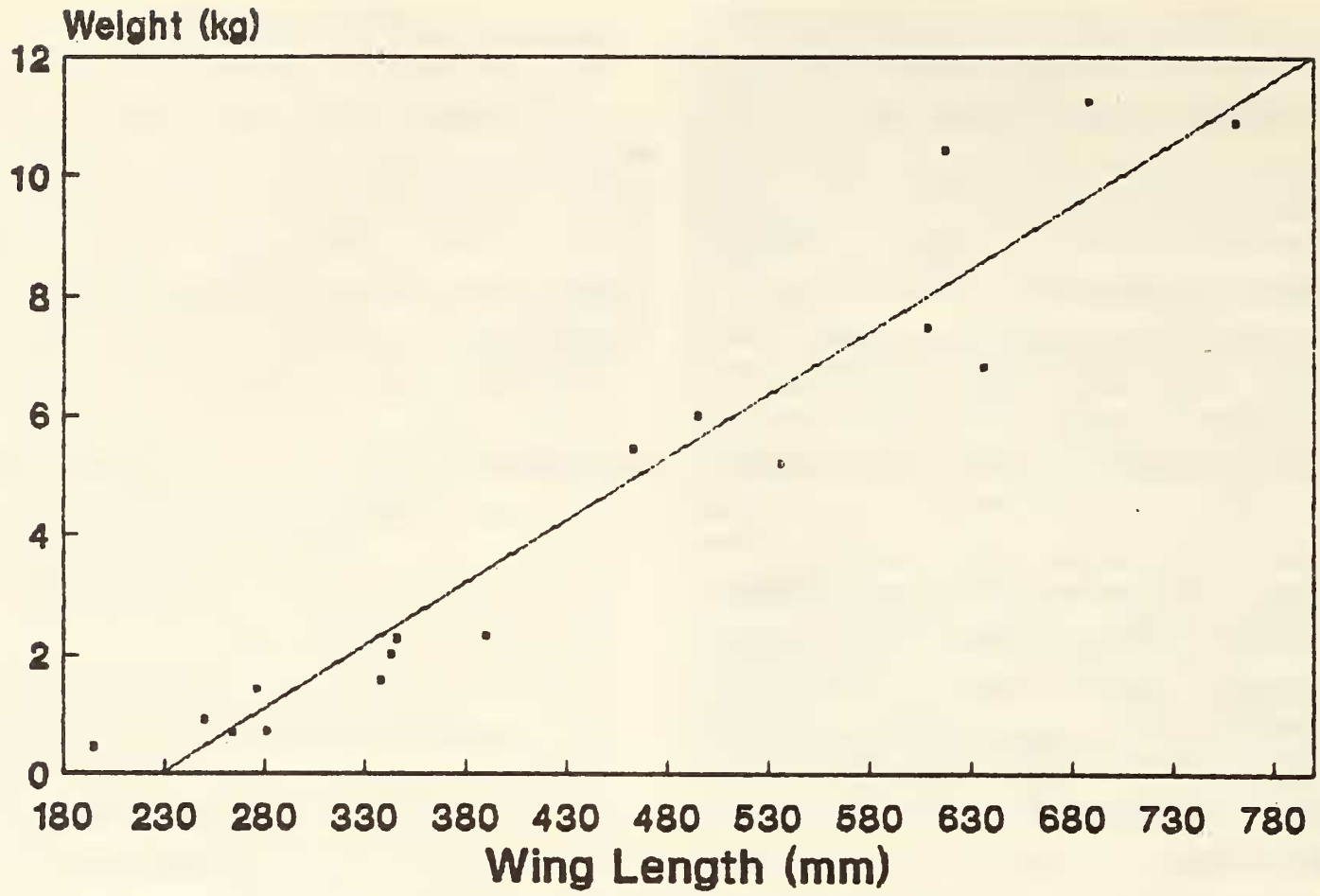

Fig. 1. Bustard wing length and body weight

In this analysis of bustard body size and display type, all data has been extracted from Ali and Ripley (1969), Cramp and Simmons (1980), and Collar *et al.* (1986). The use of body weights in the analysis was unsatisfactory because variation in available data was large (± 50% of the mean). Body weights are variable and dependent on several factors such as season, availability of food and condition of the bird. Wing length, however, shows less variation (± 20% of the mean), and once birds reach adulthood, wing length becomes more or less fixed and unless in moult, will not vary in response to extrinsic factors. Both wing length and body weight are indicators of body size, and body weight is directly correlated to wing length (Fig. 1). Thus, in this analysis, wing length is used as a measure of body size.

Bustard attraction displays are divisible into two groups, namely aerial displays and ground displays. Aerial displays can be further classified into two types, based on the duration and the type of display. The first is the jumping type of display. This is of very short duration, e.g. lesser florican one second jump, little bustard *Tetrax tetrax* half second jump, (Shulz 1985), and consists of a brief vertical display leap. The other type of aerial display is a display flight that lasts for 6 or more seconds and consists of a short or extended flight from one point to another. This type of display is seen in the black bustard *Eupodotis afra,* buff crested bustard *Eupodotis ruficrista* (?) and black bellied bustard *Eupodotis melanogaster* (Osborne *et al.* 1984) and the Bengal florican *Houbaropsis bengalensis.*

A distinct correlation is seen between body size and display types. The small bustards have aerial displays, with the smallest of these having a jumping display, those species with increased body size having flight displays, and beyond this body size all bustards have ground displays (Fig. 2). This analysis also shows that the Bengal florican and the black bellied bustard are at the

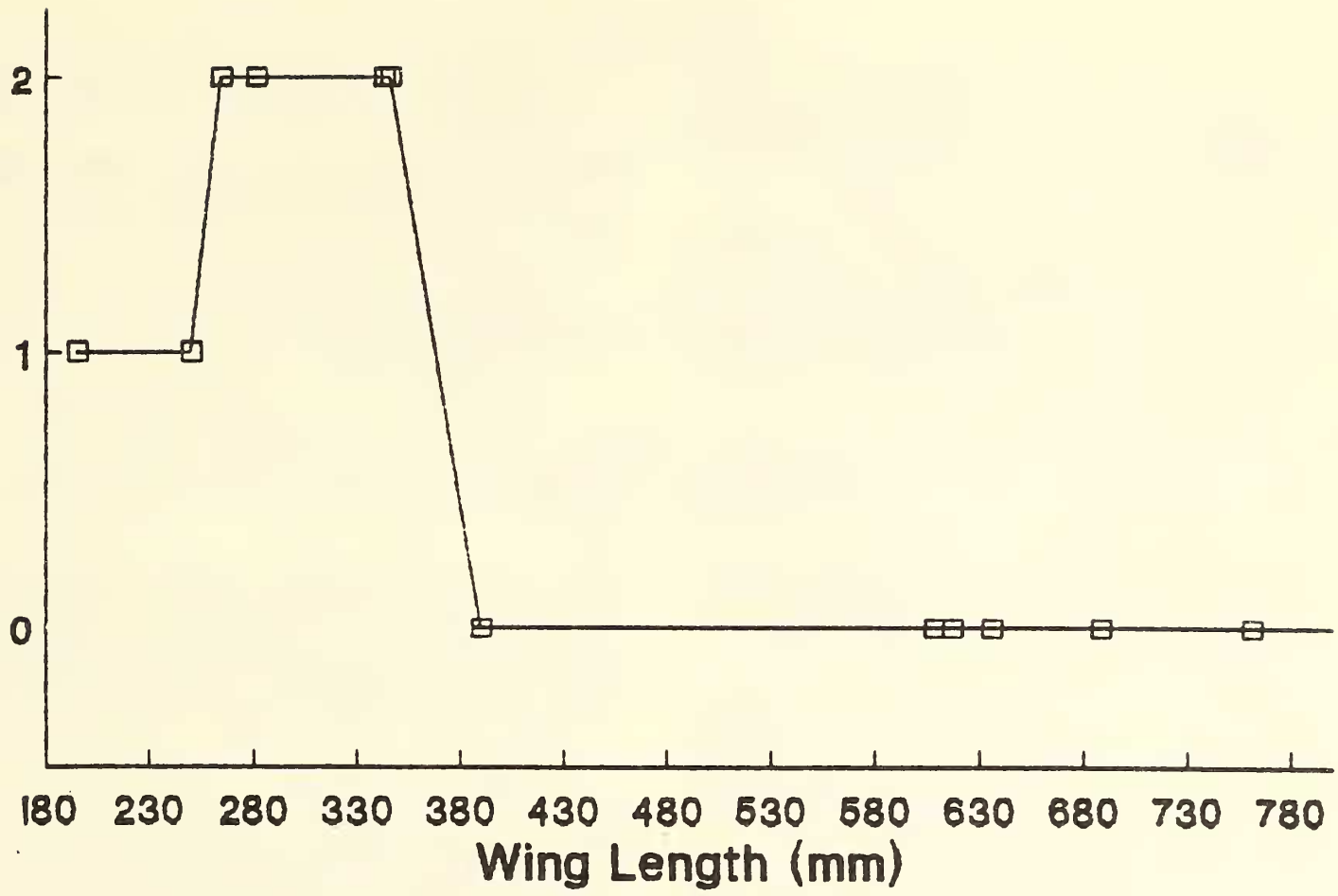

Fig. 2. The relation between bustard wing length and display type
1 = Jumping display; 2 = Flight display; 0 = Ground display

size threshold beyond which all bustards have ground displays. The next large species i.e. the houbara is 12-15% larger than the black bellied bustard and only has a ground display.

The Bengal florican, being at the body size threshold of aerial displays, has few and sporadic displays. This bustard also has a distinct ground display, the neck fluff display. A ground display is also seen in the black bellied bustard (pers. obs., Cramp and Simmons 1980). At the other extreme of the size scale is the lesser florican, which has very frequent display jumps and no distinct ground displays. It is most probable that in bustards body size plays a strong role in the type of displays seen. The smallest bustards have short display leaps that are made very frequently, larger species have longer flight displays, and as body size increases, frequency of displays reduces. Ridley *et al.* (1985) also suggest that a short leap is associated with greater frequency. Beyond a certain size threshold, all bustards have ground display.

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14. FLOCKING AND COURTSHIP DISPLAY IN REDWATTLED LAPWING (*VANELLUS INDICUS*)

The redwattled lapwing *Vanellus indicus* is one of the most common bird species found in and around Kota (25° 10' N, 75° 52' E), in Rajasthan. There are always a couple of lapwings permanently present near open drains, sewage nullahs, shallow pools & margins of tank. When the water dries up, they are quite capable of living on dry sunbaked land; they even nest and breed in April-May, when the temperature ranges between 38°C to 45°C in this part of India. Ali and Ripley (1987) write in their 'COMPACT HANDBOOK OF THE BIRDS OF INDIA AND PAKISTAN' that redwattled lapwings do not form large flocks (6-12 birds only), there is no mention of any courtship display. This note is to report a different behaviour pattern, which I have observed.

Large congregations of redwattled lapwings ranging from 26 to over 200 individuals, were seen flocking on large open drains, nullahs, pools and tanks. In this paper the term *flocking*, does not include loose congregations of birds which remain scattered on wetlands, but is strictly limited to the gathering of birds, where they stand closely packed apparently doing nothing. Incidentally, redwattled lapwings breed in Kota mainly from April to September, and a good number of eggs and chicks can be seen during this period. Just before commencement of breeding in April, I have seen large flocks near waterbodies. The number of individuals in a flock varied from 37 to 62 during February-March. These flocks are usually seen on the margins of waterbodies early in the morning, the birds then disperse to feed nearby, but flock together once the feeding is over.

Courtship display is not a very elaborate affair in redwattled lapwings but still it is attractive. The male bird presents itself in the best possible manner to the probable mate. The male bird flies off, circles the area a few times giving a different call, and returns a little later near a prospective female. After alighting a few feet away, the male raises its head, fluffs its breast feathers, so the white abdominal and contrasting black front are presented to the female. Only the little black head, red wattles and bill are seen over the puffed up breast. The bird looks upright and proud. In shuffling steps, the male approaches the female and circles around it a few times. If the female is responsive it lowers its head to about 45° from the ground and lets the male come close, otherwise the female flies off or moves away, putting an end to the advances of the eager male. The male bird tends to repeat this with different females, also many males (3-4) may be displaying close to each other with females in audience. Once the pair formation has taken place birds become highly aggressive and noisy. They become territorial and actively defend their territories against all creatures including grazing cattle, other birds, snakes, dogs and man. The redwattled lapwings while defending their